

activity of the mixture is inversely proportional to the quantity of the barium salt. In the treatment of cancerous tumours, apparatus of 500,000 activity are used. Such an apparatus usually contains from 4 to 10 milligrams of powder, consisting of one part of radium salt to three of barium salt. Cancers suitable for radium treatment range from those of small size to those of 20 to 30 square centimetres in area. The apparatus may be used in two different ways, either by the so-called dry method, consisting of short, frequently repeated applications causing resolution of the diseased tissue without external destruction, or the destructive method in which the apparatus is left in place from seven to ten hours, causing extensive destruction of the morbid tissue followed by cicatrization in eight to ten weeks.

For cancers which extend, deeply filtration of the rays is employed by the interposition of a half to several millimetres thickness of lead. In this way only the ultra-penetrating rays (the gamma-rays and the hardest beta-rays) are allowed to enter the tissues. Long exposures are then given varying from 24 to 120 hours. These ultra-penetrating rays produce very little change in the healthy cells of the part, while they have a selective action on the cancer cells, leading to their destruction. The progress of a successful case is as follows:—After a short time (three to eight days) the tumour commences to diminish in size. Cicatrization then begins and is completed in two to four weeks, or longer in obstinate cases. In the case of ulcerating tumours, a certain amount of discharge occurs during all the stages. For large and deeply-extending tumours the method of "cross-fire" is usually employed, two or more radium apparatus being applied at different points around the tumour in such a way that the ultra-penetrating rays cross in the depths of the tumour. In this way the deeper parts of a growth can be subjected to the influence of the gamma-rays far more effectively than with a single disc of radium.

The general conclusion is to the effect that most cancerous growths can be reduced in size by the application of radium. Some of the less malignant forms of growth can apparently be cured, while in the more malignant cases the temporary improvement is of short duration, and is followed by further extension of the growth.

The treatment of lupus is described—the method of using sunlight concentrated by means of a large hollow lens formed of two plates of glass 10 or 12 inches in diameter, one of which is flat and the other convex, the cavity being filled with sulphate of copper solution to absorb the heat rays. The use of the electric arc lamp as described by Finsen arose naturally from the solar method, and is now too well known to require description. In the case of both the sunlight and the electric arc it is recognised that the violet and the ultra-violet rays are those principally concerned in the curative action. The mercury-vapour lamp, being particularly rich in violet and ultra-violet rays, is very effective, particularly when a tube of quartz is used in place of glass. It is far less expensive than the Finsen arc lamp, and has taken the place of Finsen lamps for many purposes. X-ray treatment and

radium treatment have also been employed in the treatment of lupus. The author considers light treatment the most efficacious, while radium has not been employed long enough for its value to be estimated in the case of lupus.

Ringworm is now almost universally treated with the Röntgen rays. A full account of the technical details of this method is given, and the precautions necessary to prevent injury to the patient. The object of the method is to accomplish the removal of all the diseased hairs from the affected area of the scalp. It is found that a properly applied dose of X-rays results, after a fortnight, in the loosening of the hairs, which then fall out leaving a perfectly bald area which can be readily and effectively treated by antiseptic applications. When there are numerous patches of ringworm scattered over the scalp it is necessary to produce epilation of the entire scalp. For this purpose the scalp is divided into ten or twelve areas which are exposed in turn, care being taken to prevent overlapping, as this would result in the administration of an excessive dose to some parts of the scalp. Dermatitis would appear in the over-exposed portions, and permanent baldness would probably result. After a correct dose the hairs begin to grow anew after two or three months, and the new hairs are free from the disease. By the X-ray method of treatment the cure of a case of ringworm is completed in three months, whereas the older methods of treatment by local applications extended for periods of two years or even longer. In the case of the children of the poor treated in public institutions the saving of public funds that has resulted from the introduction of the X-ray treatment of ringworm has been very considerable, and the advantage to the education of the children is self-evident, for while there are any infected hairs on the head it is necessary for the children to be rigorously excluded from intercourse with other children.

Many other diseases are described in which electrical methods of treatment have been used with success. The methods are now firmly established, and the range of their utility is being defined with ever-increasing accuracy.

A. C. JORDAN.

DEDUCTION AND DENUDATION.

Geographical Essays. By Prof. W. M. Davis. Edited by Prof. D. W. Johnson. Pp. vi+777. (London, Boston, New York, and Chicago: Ginn and Co., n.d.) Price 12s. 6d. net.

PROF. D. W. JOHNSON has done good service to science by editing this collection of the valuable memoirs by which Prof. W. M. Davis has done so much to advance physical geography and improve geographical education. The volume includes twenty-six papers hitherto scattered in twenty-one serials. The first twelve contributions are essays and lectures on geographical pedagogics; the remaining fourteen deal with various principles of physiography. It would perhaps have been more convenient if the two series had been issued separately, for the volume, though containing no plates, is heavy for its size, and while the physiographic essays may be read with great

advantage by advanced students of geology and geography, the educational section is of most use to a different circle of readers. The author's criticisms of teachers and text-books would probably have been better confined to a work expressly for teachers, as it is not always good for the intellectual discipline of students to have their often scanty faith in their instructors still further reduced. Geographical education should, moreover, proceed on such different lines in countries in different stages of development, that its discussion is of more local interest than that of physical problems, which are of universal application. The educational essays should, however, be read by all geographical teachers, who must benefit from their high ideals and valuable practical suggestions.

The fourteen physiographic essays in this volume show the development of Prof. Davis's views on denudation. The earliest in date deals with the rivers of Pennsylvania and New Jersey, and led to his well-known classification of rivers according to their relation to the original slope of the land. The wearing away of the land to a plain sloping slowly to the sea is brought out in two papers on the peneplain and on base level, and they lead to the geographical cycle due to the interaction between uplift and denudation. The course of the geographical cycle in an arid climate is discussed in a memoir first published by Prof. Davis in 1905. Among the other papers included are those on glacial erosion in France, Switzerland, and Norway (1900), on the sculpture of mountains by glaciers (1905), on the mountain ranges of the Great Basin, and on the remarkable instances of river capture in the valleys of the Seine, Meuse, and Moselle.

The most striking feature in Prof. Davis's geographical writings is his devotion to the deductive method. He rejects emphatically the view that geography is to be advanced chiefly "by observation, description, and generalisation." To use those methods only is, he says, to walk on one foot. He claims that invention and deduction are as necessary to geography as to any other science. Many of his valuable results are due to his keen insight and not to his method, which cannot be unduly adopted without altering the position of geography in the circle of sciences. The very name geography implies that the subject is descriptive rather than deductive, although some deduction is required by all schools of geographers. But it has hitherto been found convenient to limit geographical work mainly to observation, description, and generalisation, restricting advanced deductive methods to the special problem of geography—the relation of the earth to man. The subject-matter of geography is so enormous that it seems reasonable as well as convenient that there should be a special science and societies devoted to the mapping and description of the earth as it is, leaving its evolution and explanation to other sciences.

Geology, on the other hand, is a "logos," not a "graphie"! and hence requires a more intimate connection of observation and inference than does physical geography. Much that Prof. Davis calls geography has been generally regarded as geology. The distinction that has been so long established and has worked so well in this country, is shown by Prof.

Davis himself to have been accepted also in America; for he is professor of geology at Harvard and not of geography. Most of his physiographic essays are quite appropriate to a geological school, and they have been more read in this country by geologists than by geographers. Four of them were published in geological and six in geographical journals.

Prof. Davis, however, regards geology and geography as essentially the same. "They are parts of one great subject," he says (p. 196). "It is a misfortune that we have no English word to include both geography and geology" (p. 198). "To set them apart" he describes as an "obsolescent system" (p. 204). Prof. Davis, moreover, restricts geology to a minor section of the joint subject; he regards it (p. 37) as the sequence of events in the earth's history, and he regrets that such questions as rock weathering are not included in geography. The geographer must, of course, know some of the elementary facts of geology, as he does of meteorology and physics; but he has so many difficult problems connected with man on the earth that he may conveniently refer the study of complicated physical causes to astronomy, meteorology and geology. The abandonment of the conventional boundary between geography and geology would probably prove ultimately detrimental to both sciences.

The classification of some of Prof. Davis's memoirs as geology instead of geography does not lessen their high value. Probably no living writer has done so much to improve the interpretation of denudation. His deductive method and his keen insight have enabled him in studying the history of river systems to unravel confused tangles of facts, and by skipping intermediate phases to go back to stages of which most geologists thought that no traces could be surely recognised in existing geography. The two chapters on glacial erosion illustrate the advantages and the dangers of the deductive method; for according to some geologists, it has led Prof. Davis to attach undue weight to certain striking features of mountain form, and to overlook features which must be included in a complete explanation. Prof. Bonney's presidential address to the British Association has brought the controversy on glacial erosion to a head. It may be hoped that the authoritative and masterly statements on both sides will lead to an agreement as to the main facts, but no settlement can be expected until the arguments of those who limit the efficacy of glaciers as eroding agents have been directly answered.

J. W. G.

TECHNICAL ORGANIC ANALYSIS.

Allen's Commercial Organic Analysis. Vol. iii., Hydrocarbons, Petroleum, Aromatic Acids, Explosives. Edited by W. A. Davis and Samuel S. Sadtler. Fourth edition, entirely re-written. Pp. x+635. (London: J. and A. Churchill, 1910.) Price 21s. net.

THE original "Allen's Commercial Organic Analysis" had established a place of eminence in all analytical and technological laboratories and was a book—it may be said still is a book—of everyday reference. At the same time the trend of modern